CAAP Quarterly Report

Date of Report: 4 December 2020

Prepared for: *U.S. DOT Pipeline and Hazardous Materials Safety Administration*

Contract Number: 693JK32050005CAAP

Project Title: Improving Pipeline Safety During Gas Leakage Events Using Near Real-Time Data Networks and Optimal Decision-Making Tools

Prepared by: Kathleen M. Smits, The University of Texas at Arlington,
Jerry Duggan, Colorado State University

Contact Information: Kathleen M. Smits (kathleen.smits@uta.edu, (817) 272-6486)
Jerry Duggan (jerry.duggan@colostate.edu, (970) 980 – 6130)

For quarterly period ending: November 30, 2020

Business and Activity Section

(a) Contract Activity

No proposed contract modifications.

Materials purchased include those require to build natural gas detectors. This includes sensors, sensor boards, laboratory supplies (gases for testing, 3D printing supplies), and associated electronics.

(b) Status Update of Past Quarter Activities

Quarter 1 kicked off our project with a variety of activities and engagements to include kick off meetings with the internal project team, PHMSA and current and potential industry partners. Progress was made on the development of the project guidance committee, methods and protocol development and developing experimental plans for the testing of the detector network deployment and simulation-optimization algorithm (Tasks 1-2). Students were recruited and selected, in part, to participate in the project. Going forward into Quarter 2, we plan on continuing our efforts towards task 1-3 with the goal of the formation of our advisory committee, completion of the detector design and initial testing and METEC experimental design complete. Good progress was made in all areas of the project and we are currently on task/schedule. Specifics of each task can be found below.

(c) Cost share activity

None this quarter. Cost share activity will be reported next quarter.

1. Background and Objectives in the 1st Quarter

1.1 **Background** This project will (1) develop, test and deploy an innovative decision-making protocol for methane detection and quantification of belowground leaks using near real-time data and (2) establish a recommended practice to deploy the gas sensing protocol that provides and ensures that these protocols are widely applicable and accessible to end users. To

accomplish the research goals, we've teamed with partners to include pipeline operators and service providers to help develop a clear understanding of current gas leak repair and monitoring protocols, provide expertise/ lessons learned, provide access to leakage sites and serve on a technical advisory panel.

1.2 Objectives in the 1st Quarter – The main objective of Q1 was to develop/convene the project guidance committee (Task 1) and begin methods/protocol development (Task 2.0, subtask 2.1) as seen in the project timeline table below. Details of each task follow.

(d) Task 1: <u>Develop / Convene Project Guidance Committee</u>

Background/objectives: The purpose of this task is to develop a confirmed set of participants to serve in the project guidance committee based upon governance structures developed in prior studies.

Results and Discussion: Significant progress was made on this task to include three industry partners have agreed to participate in industry advisory capacities and potential experiments slated for year 2. We had the following meetings with industry partners and kick off meetings with PHMSA and the CSU/UTA project team.

Future work: Industry partner meeting to review sensor network progress will be scheduled for January 2021. Project guidance committee will be finalized February 2021.

(e) Task 2.0: <u>*Methods/Protocol Development*</u>

Background/objectives: The objective of methods/protocol develop is the development of the sensor network and the simulation-optimization algorithm. Q1 focuses on subtask 2.1 which is the methane detector network development. This includes the further development of the methane detector as well as the development of a detector network capable of collecting and integrating data from multiple detectors real-time.

Results and Discussions.
Controlling software is tested and ready for implementation. Modifications for simplicity and new enclosure are in place, and supporting documentation has been updated. The first prototype was printed, and exposed a few needed improvements to include fan tolerance, and wiring. However, even with needed improvements, the prototype turned out quite well. Preliminary, small scale proof of concept tests were performed. Two tests varying in gas leakage rate were performed to compare the results of the detectors to known concentration values.

Future work:

Future work will continue with the software, hardware and testing of the detectors and the detector network. This includes updating the website software so that data can be shared more easily, finalizing and producing the detector components as well as build and update the software nodes. For preliminary evaluation purposes, testing on the miniature test bed will be continued to work out potential design issues. This testing will continue with the prototype, then with the production models. Once the production model is finalized, then the transition to outdoor experimental tests (Task 3.0) can occur.